

Nursing Processes Related to Unplanned Intensive Care Unit Admissions

by

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Abstract

Timeliness is an important factor in the care of critically ill patients on the general wards in order to prevent an unplanned intensive care unit admission. The recognition of patient deterioration can be influenced by many factors. This study looks specifically at how communication, documentation and the recognition of patient deterioration affect unplanned intensive care unit admissions. Unplanned intensive care unit admissions may result in higher rate of mortality, longer lengths of stay and a prolonged recovery post discharge.

The goal of this retrospective quantitative research study is to explore how communication, documentation and recognition of patient deterioration are utilized by nurses in order to help prevent an unplanned intensive care admission.

This study was guided by the Nursing Role Effectiveness Model which considers how structures and processes lead to outcomes and has been utilized in many quality improvement initiatives.

Communication, documentation and recognition of patient deterioration are key components that nurses can use to improve upon patient care. The benefits to preventing patient deterioration are clearly documented. Strengthening communication, documentation and recognition of patient deterioration skills will improve patient outcomes and in turn help to prevent the need for unplanned intensive care unit admissions.

Key Words: patient deterioration, urgent, unplanned intensive care unit admission, Nursing Role Effectiveness Model

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Admissions

Chapter 1

Introduction

Patients requiring admission or readmission to the intensive care unit during their hospitalization have a higher rate of mortality, longer length of stay and a prolonged recovery post discharge (Johns, 2014). Patients who become critically ill while on the ward are at risk of receiving sub optimal or delayed care while they remain on the ward. Sub optimal or delayed care has a negative impact on overall mortality in patients who have an unplanned intensive care unit admission (Mok, Wang, & Liaw, 2015). Remaining on the ward while critically ill has been shown to be an independent predictor of mortality (Johns, 2014; Jäderling et al., 2013). Therefore it is quite desirable to prevent patients from requiring the need for unplanned intensive care unit admissions. This research study will describe the nursing processes that relate to unplanned intensive care unit admissions.

The need and concept for intensive care units developed over time. The benefit of having a separate area to care for the sickest patients was first realized during the Crimean War in the 1850's. Florence Nightingale was instrumental in ensuring that the sickest patients were placed closest to the nursing stations in order to monitor them more closely (Munro, 2010; Vincent, 2013). During World War II, many specialized shock units were opened to improve the resuscitation of injured soldiers. This was followed by specialized treatment centers in 1950 to aid patients affected by the polio epidemic and required mechanical ventilation. These initiatives eventually led to many specialized complex care areas to treat critically ill patients (Vincent, 2013). Intensive Care Units (ICU) have evolved greatly from their inception. They are much

more specialized not only in the technology that is employed to help monitor patient care but the nursing care has also become much more focused and dedicated to particular specialties.

Significance of Study

Effect on patient and family. The need for an intensive care environment can be a critical component of a patient's care while in hospital. In Canada, 11% of persons hospitalized require a critical care environment. Of those patients admitted to the intensive care unit 19% of patients will die during their ICU stay (Garland, Olafson, Ramsey, Yogendran, & Randall, 2013).

As well as surviving through the stages of critical illness, patients may also experience a number of health related issues that persist even upon discharge from hospital. Collectively called post intensive care syndrome these issues may last for a year or more following a critical illness that resulted in ICU admission (Elliott, et al., 2014; Bradford & Grassi, 2009). These symptoms or dysfunctions impact the quality of life patients experience and limit their ability to be fully independent in daily activities. Post intensive care syndrome may result in cognitive dysfunction, sleep issues, depression, post traumatic distress syndrome or ICU acquired weakness. Some of these issues may take up to a year to recover from and unfortunately some patients may never fully recover (Harvey, 2012; Bradford & Grassi, 2009). Critical illness also impacts family members of the patient and may result in them experiencing their own physical or mental health problems such as depression, anxiety and post-traumatic stress disorder (Elliott et al., 2014; Harvey, 2012).

Early detection of deteriorating patients on the wards can result in the prevention of an intensive care unit admission. This can result in improved patient outcomes by initiating treatment earlier or if needed a more timely transfer to the intensive care unit. Improving the

outcomes for patients while they remain on the ward is likely to be beneficial as it prevents many of the potential problems associated with an intensive care unit admission.

Effect on Resources. The need for intensive care beds has greatly increased and can place a great strain on resources. The number of beds available is a significant issue when patients are deteriorating quickly. Caring for patients in a critical care unit requires a great number of resources that are often quite expensive to provide in terms of physical and human resources as well as financially (Chrusch, Olafson, McMillan, Roberts & Gray, 2009). In Canada, there are approximately 6.7 critical care beds per 100,000 people (Galvin & Steele, 2010). It is estimated that the cost of admitting patients to an intensive care unit will consume 7 to 8 times more than the cost of caring for patients on a general ward (Parshuram et al., 2006; Norris, Rapaport & Hamilton, 1995).

Research Purpose

The purpose of this quantitative descriptive research study is to explore the nursing processes that are related to an unplanned admission to the intensive care unit. This study looked at the nursing processes of communication, documentation and recognition of patient deterioration to understand the complexity of these issues and how they could relate to patient outcomes, specifically unplanned intensive care unit admissions.

Research Questions

Four research questions guide this study.

- 1) What are the nursing processes related to unplanned intensive care unit admissions?
- 2) What is the vital sign documentation related to unplanned intensive care unit admission?
- 3) Is there a relationship between ‘adequate communication’ among health professionals and unplanned intensive care unit admissions?

- 4) Is there a relationship between 'adequate recognition' of patient deterioration by ward nurses and unplanned intensive care unit admission?

Chapter 2

Review of the Literature

A literature review was conducted to help determine the research that existed on the nursing processes that influenced patient outcomes, specifically unplanned intensive care unit admissions from the general wards of the hospital. Many issues were identified that potentially influence patient outcomes including the adequacy of time to provide care, nurse patient ratio and patient acuity level (De Meester, Van Bogaert, Clarke, & Bossaert, 2013; Doran et al., 2006). However, individual nurses are not able to direct these factors. This research was designed to focus in on the processes that front line nurses can assume control over. The literature review identified communication, documentation and recognition of patient deterioration as processes that frontline nurses could improve upon independently of others in regards to unplanned intensive care unit admissions.

The key words utilized for this literature review included unplanned intensive care unit admissions, patient deterioration, wards, nursing care, critically ill patients and Nursing Role Effectiveness Model. The years searched were from 1990 to the present time in the CINAHL database.

According to the International Council of Nurses (2014), “Nursing encompasses autonomous and collaborative care of individuals of all ages, families, groups and communities, sick or well and in all settings. Nursing includes the promotion of health, prevention of illness, and the care of ill, disabled and dying people. Advocacy, promotion of a safe environment, research, participation in shaping health policy and in patient and health systems management, and education are also key nursing roles” (para.1). Nurses have a wide variety of education and experience levels. In Ontario, there are also several different designations that a nurse may use

depending upon their educational background. These are the roles of (RN) registered nurses, (RPN) registered practical nurses and (NP) nurse practitioners (Registered Nurses Association of Ontario). This study was conducted at a hospital that only employs registered nurses as direct caregivers. In some departments the role of the nurse practitioner is also utilized. The RPN role is not utilized in this study setting.

Although there are different nursing roles present within the study site the registered nurses are responsible for the acquisition and documentation of vital signs. Vital signs are typically ordered following traditional preset routines regardless of patient needs (Moola, Xue, Lockwood & Schultz, 2008). At times the registered nurse may choose to collect vital signs more frequently. This could be based on their knowledge, judgment and experience level. These factors may be influenced by structure variables such as educational levels and where education took place or organizational variables such as workload and assignment patterns.

Communication. Communication has been described as an exchange of information between a sender and a receiver (Manojlovich, 2010). The information that is passed between health care professionals has the potential to break down on either the sender's or receivers end. Effective communication and sharing of patient information can help improve patient safety and prevent adverse events from occurring (Jukkala, James, Autrey, Azuero & Miltner, 2012). Organizational culture and attitudes can often influence the information that is shared amongst health care professionals (Classen, 2010).

According to the USA's Joint Commission's Sentinel Event Database, communication breakdowns are part of the root cause of almost every event studied (Deering, Johnston & Colacchio, 2011; Nadzam, 2009). Issues related to communication failures have been described as a significant obstacle to patient safety (Manjolvovich, 2010).

The hospital environment has become an increasing complex system and as such the potential for communication failures increases (Eberhardt, 2014). Breaks in communication can lead to inconsistent patient care and lack of information to base decisions on. Nursing, which is an around the clock presence at the bedside comprises a key aspect of communication sharing, whether it is in conjunction with another nurse, a physician, patient, family members or another member of the health care team (Holly & Politeck, 2013; Anthony & Preuss, 2002).

At times the communication process becomes flawed when hierarchal issues are present (Manojlovich, 2010; Mackintosh & Sandall, 2010; Nadzam, 2009; Endacott, Kidd, Chaboyer, & Edington, 2007). These hierarchal issues can come into play between nurses, nurses and physicians or nurses and other health care team members. When channels of communication break down or become fragmented between health care professionals, the effect can be a threat to patient safety (Abraham, Nguyen, Almoosa, Patel, & Patel, 2011; Endacott et al., 2007; Anthony & Preuss, 2002).

Communication may break down due to the inability of nurses to articulate patient problems which may be based on subjective data rather than objective data. It has been hypothesized that nurses may have difficulty in expressing information in a manner that would correlate with the severity of the situation (Lo, 2011; Hairon, 2007). The perceived inability to adequately articulate concerns about potential deterioration in patients may result in the nurse not contacting the most responsible physician until a specific problem has been identified and they have objective evidence to present (Odell, Victor & Oliver, 2009; Andrews & Waterman, 2005). Poor verbal communication is a significant impediment to safe patient care and the creation of adverse events (Lo, 2011; Hairon, 2007).

Communication about patients is essential for appropriate decision making. It has been found that when more than one member of a team has information than that information is more likely to be shared and the communication process is improved. Conversely, when information has not been shared than the process for errors or missing vital cues to patient deterioration have a higher potential to be missed (Abraham et al., 2011; Strople & Ottani, 2006; Anthony & Preuss, 2002). This can be especially significant during periods of handover from one shift to the next (Abraham et al., 2011; Strople & Ottani, 2006). Effective communication strategies can encourage the reporting of subtle signs of patient deterioration prior to the need for rapid intervention (Eberhardt, 2014; Classen, 2010). Poor communication has been recognized as the leading cause of adverse events within the hospital community. It has also been identified as a major root cause in sentinel events (Manojlovich et al, 2015).

Documentation.

Documentation of patient care is a critical component of nursing practice. It allows for effective communication about the patient's condition and response to treatment (Kelley, Brandon, & Docherty, 2011). According to the College of Nurses of Ontario (2008), documentation supports a monitoring process of patient care and reflects the nursing care that has been provided. The quality of nursing documentation can support effective communication between nurses or other health personnel. It also provides an effective means of conveying the required information so that the most appropriate health care decisions can be made (Wang, Hailey, & Yu, 2011).

Insight as to the reasons for lack of documentation includes time restraints, lack of expertise and lack of monitoring equipment. Inadequate documentation may also result from a lack of resources, (Kohle-Ersher, Chatterjee, Osmanbeyoglu, Hochheiser & Bartos, 2012)

workload difficulties, lack of guidelines for completing documentation and ambivalence towards documentation (De Meester et al., 2013). These can be greatly influenced by cultural attitudes or organizational bureaucracy. The amount of time required for documentation may also play a role in how much information is recorded. When time is a barrier, documentation may be left until much later in the shift. This can result in the loss of pertinent patient information and therefore in undesirable outcomes (De Meester et al., 2013).

When documentation is inadequate it can contribute to compromised patient safety and potentially adverse patient outcomes (Ludikhuizen, Smorenburg, de Rooij & de Jonge, 2012; Braaf, Manias, & Riley, 2011). Location and availability of computers for documentation within the electronic health record can influence the ability of the nurse to actually document. As well, workload may impede a nurse's ability to document, especially if it is not regarded as a high priority (Kohle-Ersher et al., 2012).

The impact of inadequate documentation can be serious and can be a contributing factor to an unexpected intensive care unit admission. For example, one of the earliest signs that a patient may be deteriorating is the presence of abnormal respiratory rates (Jonsson, Jonsdottir, Möller, & Baldursdottir, 2011; Considine & Botti, 2004). Though this may not be true for every patient who is at risk of deterioration it has been found to be prevalent in those who experience an unplanned admission to the intensive care unit (Jonsson et al., 2011; Kennedy, Joyce, Howell, Mottley & Shapiro, 2010; Considine, 2005). It is also the least documented vital sign by health care professionals (Jonsson et al., 2011). In a study by Hogan (2006) respiratory rates were documented in only half of the patients on the general wards (as cited in Jonsson et al., 2011).

Recognition of Patient deterioration

Early anticipation and prevention of adverse events are critical components of patient safety and central to the role of the nurse within the hospital system (Mok et al., 2015; Boyle, 2004). Nurses continually assess, anticipate, intervene and apply clinical judgment in order to detect signs of potential deterioration in patients (Ashcraft, 2004). Early recognition and correction of physiological abnormalities can aid in the prevention of the deterioration of patients (Mok et al, 2015; Considine, 2005). Deaths have resulted in part from lack of observation, documentation, and recognition of deterioration as well as a lack of communication between health care providers (Mapp, Davis & Krowchuk, 2013).

Prior to cardiac arrest events there are often physiological changes present in vital signs for four, eight or more hours (Ludikhuize et al., 2012; Mapp et al., 2013). Franklin & Mathew (2001) found that between 60 and 84 % of patients who experienced primary events such as cardiac arrest, death or unplanned ICU admissions also presented with changes in vital signs prior to cardiac arrest but were not acted upon (as cited in Anthony & Preuss, 2002, p. 212). It has also been realized that hypotension, tachypnea and tachycardia were the most common precursors to hospital deaths. Recognition of these changes in vital signs is paramount in preventing adverse events from occurring (Buist, Jarmoloski, Burton, Bernard, Waxman, & Anderson, 1999).

Nurses engaged in the act of surveillance are in a key position to detect these changes and improve patient outcomes (Mok et al., 2015; Mapp et al., 2013). Detection of patients who are clinically deteriorating can often be identified hours before an admission to the intensive care unit from the ward becomes necessary. Several authors have suggested that failure to recognize and therefore act on the deterioration of patients, results in suboptimal care for critically ill

patients on wards (Mok et al., 2015; Odell, 2015; Nurmi, Harjola, Nolan, & Castre, 2005; Considine, 2005). This can result in delayed admission to the intensive care unit which has a significant impact on patient morbidity and mortality (Mapp et al., 2013; Jeffs, Law, Baker, & Norton, 2005; Cuthbertson, Boroujerdi, McKie, Aucott, & Prescott, 2007).

Respiratory failure is the most common reason for unplanned intensive care unit admissions (Jonsson et al, 2011; De Meester et al., 2013). Ratray et al, (2011) found that for most nurses the identification of one variable, such as a change in respiratory rate, did not typically trigger the need for further assistance for a patient. The research showed that nurses tend to gather multiple data and it was the combination of variables such as changes in heart rate, respiratory rate or blood pressure that led to the realization that the patient was potentially deteriorating and further assistance was sought.

Vital signs are not the only biomarkers available that may alert nurses to changes in patient conditions. A patient's level of consciousness can help to identify early and subtle changes in a patient's condition. This change in level of consciousness may show itself as agitation, confusion or drowsiness. It may be the result of metabolic abnormalities, hypoxia, hypotension or other conditions that could be detrimental to a patient's health status (McNarry & Goldhill, 2003).

Urine output can be another key biomarker that a patient's condition has changed and will potentially deteriorate. It can be an early sign that a patient is deteriorating and also result from another issue such as hypotension (Gardner, Mooney & Forester, 2014). Decreased urine output can lead to acute kidney injury which is associated with an increased mortality rate and length of stay in hospital (Macedo, Malhotra, Bouchard, Wynn & Mehta, 2011).

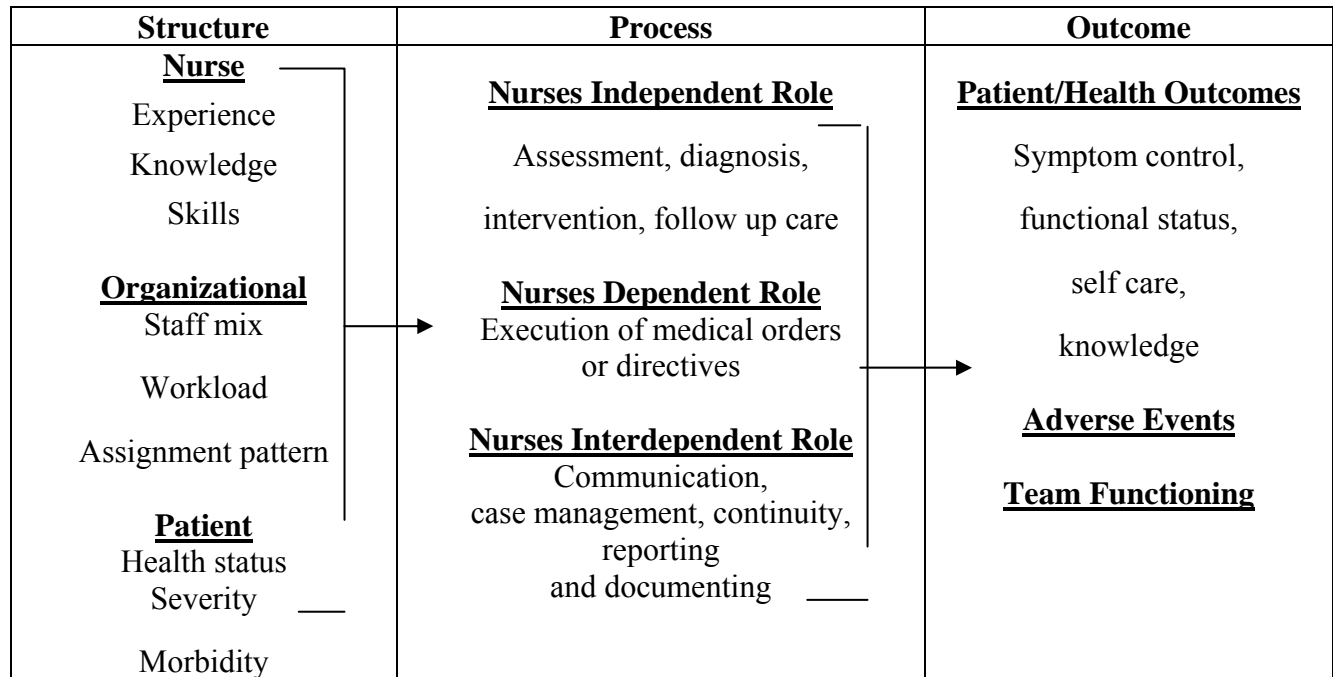
A literature search was conducted using three main sources: electronic databases, reference lists and the internet. The electronic databases searched included CINAHL and PubMed. The articles reviewed included those that studied nurses role in patient deterioration, detection of deterioration and perception in preventing adverse events related to patient deterioration. The years searched were from 1990 to the present time.

Following a literature review search it was realized that most studies that look specifically at the role of the nurse in regards to patient deterioration are not Canadian. The four studies reviewed from the CINAHL database were from the Netherlands, the United Kingdom and Australia (Ludikhuizen, Smorenburg, de Rooij, & de Jonge, 2012; Odell, Victor, & Oliver, 2009; Endacott, Kidd, Chaboyer, & Edington, 2007; Considine, 2005). Most studies centered on track and trigger systems or rapid response systems. These types of studies provided a great deal of background information in understanding patient deterioration on the general wards of the hospital.

Conceptual Framework: The Nursing Role Effectiveness Model

The Nursing Role Effectiveness Model (Figure 1) provides a framework that helps to describe and understand the role of the nurse and the achievement of patient outcomes (Doran, et al., 2006). The Nursing Role Effectiveness Model stems from Donabedian's 1996 framework and has helped to guide many research studies focused on quality health care improvement (Mitchell, Ferketich, & Jennings, 1998). As Donabedian's framework described quality according to three constructs: structure, process, and outcomes so too does the Nursing Role Effectiveness Model (Kelley et al., 2011).

Figure 2.1, The Nursing Role Effectiveness Model (Irvine, Sidani, & Hall, 1998).



Structure; according to the Nursing Role Effectiveness Model consists of nurse, patient and organizational variables. Nurse variables include those related to the level of education, skills and experience that one has obtained. Patient variables include demographics such as age and gender. It also encompasses the severity of illness present and co-morbidities. Organizational variables include staffing mix, assignment patterns and workload (Irvine et al., 1998; Sidani & Irvine, 1999; Doran, Sidani, Keatings & Doidge, 2002).

The Process component of the framework includes the variables of independent, dependent and interdependent actions that a nurse performs on an ongoing basis. Independent variables are those that do not require a physician directive or order such as assessment, monitoring and evaluation of patient outcome. Dependent functions include those interventions that require a medical order such as the administration of medications. Interdependent functions

include the collaboration of care that nurses share with other members of the health team to coordinate patient care (Irvine et al., 1998; Sidani & Irvine, 1999; Doran et al., 2002).

The Outcome component of the Nursing Role Effectiveness Model considers outcomes; including adverse events, team functioning and patient results of nursing care. The results of nursing care are comprised of patient care outcomes such as symptom control, quality of life and freedom from adverse events. This component also incorporates the level of team functioning and communication which can influence patient care and outcomes (Irvine et al., 1998; Sidani & Irvine, 1999; Doran et al., 2002).

The Nursing Role Effectiveness Model represents the multidimensional nature of a nursing care situation. This model can be used as a framework to better understand the underlying mechanisms that nursing care has on patient outcomes (Irvine et al., 1999).

Chapter 3

Methods

Research Objective

The objective of this quantitative descriptive research study was to identify the nursing processes that are related to unplanned intensive care unit admissions. Specifically the goal was to understand and determine if nursing process such as communication, documentation and recognition of patient deterioration were ultimately associated with unplanned intensive care unit admissions.

Research Design

This study was a descriptive retrospective cohort research design that utilized chart audit analysis to obtain data.

Study Setting

The study site selected was an acute care hospital in Toronto, Ontario. It provides acute care services for many different specialties including neurosurgery, trauma, cardiovascular, orthopedic and medical care.

Sample

The sample was obtained by reviewing the admission book from the medical surgical intensive care unit and determining what participants met the inclusion criteria over the course of the 12 month time frame. A convenience sample of 144 charts was retrospectively analyzed. Systematic sampling was utilized by selecting the first 12 charts from each month over a one year time span that met the inclusion criteria. The charts were reviewed in the order that they appeared in the admission book. The convenience sample resulted in a wide selection of

participants that were admitted to the intensive care unit from a variety of departments and those patients in turn were cared for by many different practitioners.

A total of 144 charts were analyzed. Sufficient power analysis was determined thru the G*Power Analysis Program to ensure an adequate sample size was obtained (Faul, Erdfelder, Lang & Buchner, 2007).

Retrospective chart reviews are widely used in many types of studies to help understand or describe an issue, relationships or comparisons between groups. It is typically patient centered as the data comes from patient charts. There are, however, some limitations to retrospective chart review including the sampling strategy. A convenience sample was used in this study for reasons of practicality. This type of sampling can limit the generalizability of the study data (Vassar & Holzman, 2013).

Data Collection

The researcher scheduled time at the hospital in the medical records department. The medical records department provided access and guidance to the hospital's electronic charting system. Data collection was collected over the period of 2 months. The charts were reviewed from February 1, 2013 to January 31, 2014 with the first 12 selected from each month that met the appropriate criteria. The researcher reviewed the charts and entered data into a separate excel file coded to reflect the chart audit tool that was developed for the purposes of this research.

Inclusion Criteria

Inclusion criteria for this study included patients over the age of 18 at the time of admission to hospital and patients that were admitted from the general wards of the hospital to the medical surgical intensive care unit.

Exclusion Criteria

Exclusion criteria were those patients under the age of 18 at time of admission to hospital. These patients were excluded in order to focus on adult patients only as the vast majority of patients admitted to the medical surgical intensive care unit are over the age of 18. Patients who arrived to the medical intensive care unit from the Emergency Room, Operating Room, Post Anesthetic Care Unit, Step Up Unit or other Intensive Care Units.

Data Collection Tool

An extensive review of the literature did not reveal any chart audit forms that focused specifically on nursing process that related to unplanned intensive care unit admissions. Based on the literature that was reviewed and drawing from the nursing experience of the researcher and thesis committee, a chart audit tool was created. To help ensure accuracy a test retest methodology was employed (Polit & Beck, 2012). After the first 10 charts were reviewed they were set aside for 2 weeks. At that point the charts were reanalyzed by the same researcher to ensure accuracy of the information collected.

Creation of the Chart Audit Tool

The chart audit tool was developed based on the Nursing Role Effectiveness Model (Sidani, & Irvine, 1999). In the structure component selected patient characteristics were studied. This included the ages of participants, gender, co-morbidities, medical diagnosis and whether there was a previous intensive care unit admission during the current hospitalization.

Data regarding communication was also collected. This included communication, documented in the patient chart, between the nurse and the most responsible physician as well as to the critical care response team. Communication reflects the interdependent role that nurses have within the process component of the Nursing Role Effectiveness Model. Adequate

communication for the purposes of this study related to identifying whether the registered nurse contacted the most responsible physician or the critical care response team.

Documentation and recognition of patient deterioration are also situated within the process component of the model. They represent both independent and interdependent aspects of nursing. This data was collected in the form of vital sign documentation as well as urinary output and level of consciousness. Adequate documentation for the purposes of this study included whether there was documentation of vital signs recorded on the electronic health care record.

Other data of interest but not specifically part of the Nursing Role Effectiveness Model included the service that patients were admitted to the intensive care unit under, the day of the week admission took place and the time that the patient was admitted.

Data Analysis

Descriptive analysis was used to demonstrate demographics of the sample as well as to identify patterns and outliers. Chi Square tests and Spearman correlation statistical analyses were utilized to explore the research questions, specifically to determine if there were any significant associations or correlations between the variables in the chart audit tool. Statistical analysis was conducted using SPSS version 21.

Ethical Considerations

Research Ethics Board approval was first obtained from Laurentian University. The proposal was then submitted to St. Michael's Hospital Research Ethics Board and approval was obtained.

Chapter 4

Data Analysis

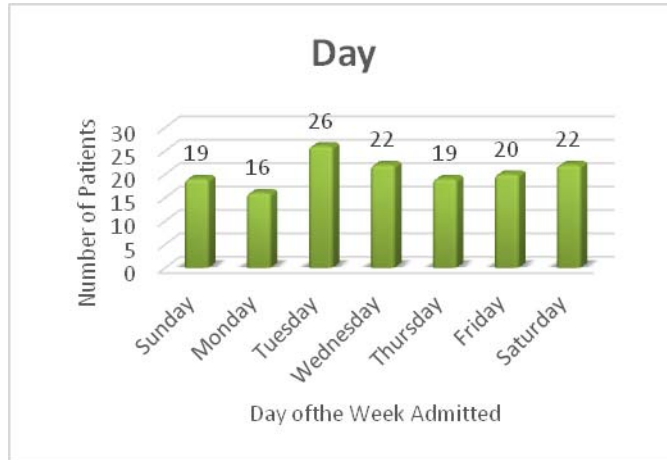
Ages of Subjects in Chart Audit. Descriptive statistics were used to generate the demographic data including age and gender. The sample size for this research study was $n=144$. Power analysis revealed an alpha of 0.05, beta 0.75 and effect size of 0.2. This was composed of 79 (54.9%) male and 65 (45.1%) female participants. As shown in Table 1, the ages of participants ranged from 20 to 91. The average age of persons was 58.8. The majority of people with an unplanned intensive care unit admission were between the ages of 60 to 80 (40.28%). This was followed by persons between the ages of 41 and 50 with 26 (18.05%) admissions.

Table 4.1, Ages of Participants

Age Group	Frequency	Percentage
20 to 30	9	6.25%
31 to 40	12	8.3%
41 to 50	26	18.05%
51 to 60	24	16.6%
61 to 70	29	20.1%
71 to 80	29	20.1%
81 to 100	15	10.4%

Day of Admission. Patients may require admission to the intensive care unit any day of the week as well as at any time of the day. The most frequent day of the week for admission to the intensive care unit was Tuesdays with 26 (18.06%) admissions, followed by Wednesdays and Saturdays both with 22 admissions each. Mondays were the day of the week with the fewest admissions 16 (11.11%). Chart 2 presents the day of the week of admissions to the intensive care unit.

Chart 4.1, Day of Week of Admission



Time of Day. Time data was also collected and showed that most admissions 50 (34.72%) occurred between the hours of noon and 1800 hours. This was followed by 39 (27.08%) admissions between 1800 and midnight, 34 (13.19%) between midnight and 0600 hours and lastly 21 (14.58%) occurred between 0600 and 1200 hours.

Admitting Diagnosis. The most common reason for unplanned intensive care unit admission was respiratory distress 76 (52.7%). This included an admission diagnosis of pneumonia, cystic fibrosis exacerbation, chronic obstructive pulmonary disease (COPD), asthma exacerbation, respiratory arrest and bronchiectasis.

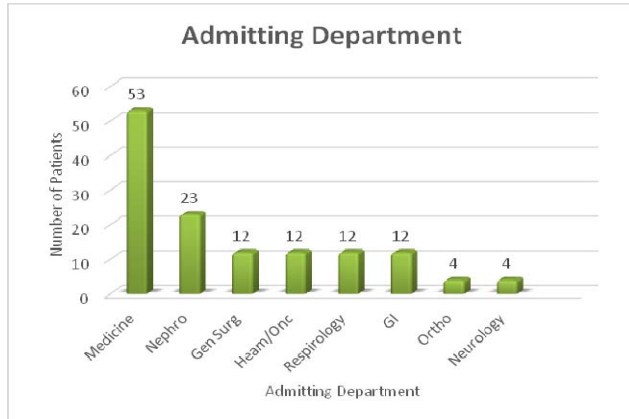
Co Morbidities. The average number of co morbidities per patient was 3.5. The most common co morbidities documented in the chart were hypertension, diabetes mellitus and chronic obstructive pulmonary disease. Diseases related to the cardiovascular system, specifically dyslipidemia, atrial fibrillation and congestive heart failure were also in the top 10 of the most common co morbidities documented. Excessive use of alcohol, asthma, history of cancer and depression rounded out the most frequent co morbidities present in the charts reviewed.

Table 4.2, Frequencies of the top 10 Co Morbidities

Co Morbidity	Frequency	Percentage
Hypertension	38	26.38%
Diabetes	27	18.75%
COPD (Chronic obstructive pulmonary disease)	22	15.2%
ETOH (ethyl alcohol use)	21	14.58%
Atrial Fibrillation	19	13.19%
Increased Cholesterol	16	11.11%
Asthma	16	11.11%
History of Cancer	16	11.11%
Congestive Heart Failure	15	10.41%
Depression	14	9.72%

Admission Service. The service that patients were admitted to was varied. The most frequent admitting service to the medical/surgical intensive care unit was General Internal Medicine with 53 (37.06%) of admissions. This was followed by nephrology with 23 (16.08%) admissions. The Respiriology, Gastrointestinal (GI), General Surgery and Hematology/Oncology services all had 12 (8.39%) admissions each. Other services including Neurology, Urology and Orthopedics had 4 or less admissions each. In addition, of the participants who had an unplanned intensive care unit admission 40 (27.78%) had a previous intensive care unit admission during the current hospitalization.

Chart 4.2, Department prior to ICU Admission



- 1) Is there a relationship between ‘adequate communication’ amongst health care professionals and unplanned intensive care unit admissions?

Communication with MRP. Communication with the most responsible physician (MRP) was documented in the nurses notes on 119 (82.64%) of charts reviewed. Missing documentation of communication with the MRP occurred in 25 (17.35%) of charts reviewed. Communication with the critical care response team (CCRT) was documented in the nursing notes 97 (67.36%) of the charts reviewed.

A Spearman’s correlation was conducted to determine whether there was a correlation between the number of times vital signs were taken and communication with the most responsible physician. There is a significant medium negative correlation between the number of times that vital signs were taken in the 12 hours prior to intensive care unit admission and communication with the most responsible physician. $r_s = -0.291$, $p = .001$.

Communication with CCRT. A Spearman’s correlation was then conducted for whether there was a correlation between communication with the critical care response team (CCRT) and the number of vital signs taken in the 12 hours prior to intensive care unit admission. There was a

significant medium negative correlation found between the number of times vital signs taken and communication with the critical care response team. $r_s = -0.254$, $p = 0.002$.

- 2) Is there a relationship between vital sign documentation and unplanned intensive care unit admissions?

Vital Sign Documentation. Vital sign data was collected in the 12 hours prior to unplanned intensive care unit admission. The average number of times vital signs were taken within the 12 hours prior to intensive care unit admission was 3.4. Vital sign documentation was absent in 12 of the charts reviewed. In total for 144 participants, there were 491 sets of vital signs taken in the 12 hours prior to intensive care unit admission.

Vital Signs and Previous ICU Admission. A Chi square test for association was conducted for those patients who had a previous intensive care unit admission during the current hospitalization and the number of vital signs that were taken in the 12 hours prior to intensive care unit admission. All expected cell frequencies were less than 5. There was no statistically significant association between the two. $\chi^2(1) = 12.841$; $p = 0.460$.

Vital Signs and Age/Gender. A chi square test for association was conducted to determine whether there was an association between the number of times vital signs were taken in the 12 hours prior to intensive care unit admission and age or gender. There was no significant association between number of vital signs taken and age, $\chi^2 = 684.995$; $p = 0.871$ or gender. $\chi^2 = 14.681$; $p = 0.328$.

Vital Signs and Respiratory Distress Diagnosis. There were a total of 491 sets of vital signs 12 hours prior to an unplanned intensive care unit admission for 144 patients. A Spearman's correlation was conducted to determine whether there was a correlation between how many times vital signs were taken for each patient and admission to the intensive care unit with a

diagnosis of respiratory distress. No significant correlation was found between the two. $r_s = 0.026$, $p = 0.759$.

- 3) Is there ‘adequate recognition’ of patient deterioration by nurses prior to unplanned intensive care unit admission?

Respiratory Distress and Respiratory Rate. It was found that of the patients who were admitted with respiratory distress 56 out of 76 (73.68%) patients did not have a documented respiratory rate in at least one set of vital signs. In patients that were admitted for reasons other than respiratory distress the respiratory rate was missing in at least one set of vital signs taken from 51 out of 67 (76.12%) patients.

Table 4.3 Reason for admission and Missing Respiratory Rates

Reason for Admission	Respiratory Rate Missing in one or more sets of vital signs	Percentage
Respiratory Distress	56	73.68%
Other	51	76.12%

A Chi square test for association was then conducted between an admission diagnosis of respiratory distress and whether patients had documented respiratory rates. One cell frequency was less than 5 therefore a Fischer’s exact test was used for analysis. There was no significant association between an admitting diagnosis of respiratory distress and documented respiratory rates. $\chi^2(1) = .112$; $p = 0.738$. The chi square test for association was also conducted for whether patients had a respiratory rate documented either two or three times in the 12 hours prior to intensive care unit admission. There was no statistically significant association between either having two respiratory rates documented, $\chi^2(1) = 2.757$, $p = 0.097$, or three, $\chi^2(1) = 1.039$, $p = 0.308$.

Respiratory Distress and Oxygen Saturation. A chi square test for association was conducted between an admitting diagnosis of respiratory distress and whether oxygen saturation had been documented in the 12 hours leading up to ICU admission. All expected cell frequencies were greater than five. There was no statistically significant association between ICU respiratory distress admissions and whether oxygen saturations had been documented. $\chi^2(1) = 1.047, p = 0.306$

Respiratory Distress and Level of Consciousness. A chi square test for association was conducted between an admitting diagnosis of respiratory distress and documentation of level of consciousness. All expected cell frequencies were greater than five. There was no statistically significant association between intensive care unit admissions for respiratory distress and documentation in the level of consciousness of patients. $\chi^2(1) = 2.673, p = 0.102$.

Respiratory Distress and Urine Output. Documentation of urine output was collected in 50 (34.7%) patients. A chi square test for association was conducted between an admitting diagnosis of respiratory distress and documentation of urine output. All expected cell frequencies were greater than five. There was no statistically significant association between intensive care unit admissions for respiratory distress and documentation of urine output. $\chi^2(1) = 0.520, p = 0.471$.

Chapter 5

Discussion

The Nursing Role Effectiveness Model states that outcomes are influenced by both structure and process constructs. In the Nursing Role Effectiveness Model patient characteristics can greatly influence patient outcomes. The characteristics of patients included in this study included age, gender, medical diagnosis, co morbidities and previous admission to the intensive care unit during the current hospitalization.

Age. The age range of participants was 20 to 91. The greatest number of people who experienced an unplanned intensive care unit admission were between the ages of 61 to 80. The rate of ICU admission dropped dramatically after the age of 80 with only 15 people being admitted. The average age of persons admitted to the intensive care unit was 58.8. This is also reflective of the average age population in Canada (Statistics Canada, 2014).

The average age of the population is increasing globally. Persons over the age of 80 are projected to make up 6.5 % of the population in North America by the year 2050 (Bagshaw et al., 2009). Currently, persons over the age of 80 constitute 4.1 % of the population in Canada (Statistics Canada, 2014). Bagshaw et al., (2009) further predicted that the need for intensive care unit resources for those 80 and above would increase by 72 %. With this expansion of persons over the age of 80 it would be very helpful to develop nursing skills that would allow for preventing the need for intensive care unit admission during hospitalization.

Co-Morbidities. The patients with unplanned admissions had an average of close to four co-morbidities. As people age the number of co morbidities increases which can lead to a significant burden on the health of those over the age of 65. Typically, persons with more than one co morbidity have a lesser quality of life and require a greater number of health care resources

(Canadian Institute for Health Information, 2011). The promotion of healthy lifestyle changes, management of chronic illnesses and early identification of severe illness while in hospital could lead to preventing the need for intensive care unit admission. Improved management of chronic illnesses could also aid in preventing the need for hospitalization as well.

Gender. The number of men with unplanned admissions was similar, but higher to that of women. While Canada has made great gains in ensuring equality between both sexes there are still some gender related gaps in health care. Many health related problems or diseases that were previously thought to affect mostly men left women undiagnosed and therefore undertreated. This is especially prevalent in the area of cardiovascular disease. Heart disease was at one time considered only a male disease. Historically, women have not been treated as aggressively as men for heart disease or given potentially lifesaving treatments (Agency for Health Care Research and Quality, 2012; Texas Heart Institute, n.d). Often, when a diagnosis occurred the heart disease was in a much more advanced stage than if it had been treated earlier and carried with it a poorer prognosis (Texas Heart Institute, n.d.). Although this study did not look specifically at heart disease in women it is interesting to note that the top two co morbidities of hypertension and diabetes are often associated with heart disease (Tong & Stevenson, 2007). In this study, males accounted for almost 55% of the charts reviewed while females accounted for only 45. Globally, women tend to live longer but have a greater number of co morbidities (Arnsberger, Lynch & Li, 2012).

Previous ICU Admission. Persons who have had a previous intensive care unit stay during their hospitalization and subsequently require another admission to the intensive care unit are at greater risk of morbidity, mortality and longer length of stay. In a study by Lee et al, 2009 it was found that patients with respiratory and cardiac diseases were at the greatest risk of readmission

to the intensive care unit. As well, the readmission diagnosis was often a result of the original issue. The data in this study revealed that there was no correlation between a previous intensive care unit admission and the number of vital signs taken. This suggests that this population of patients follow the traditional pattern of vital sign attainment and no extra consideration is given to the fact that they could be at an increased risk if they were to deteriorate again.

Admitting Patterns. This study found that the most frequent day of admission was Tuesday and the most frequent time was between 1200 and 1800 hours. This could be related to a higher level of surveillance present on wards during the week and in the middle of the day when there are typically a higher percentage of nurses on duty as well as allied health staff. Nurse to patient ratios tend to decrease on night shifts (de Cordova, Phibbs, Schmitt & Stone, 2014; Needleman, Buerhaus, Pankratz, Leibson, & Stevens, 2011). This could result in more eyes on the patient and subsequent intervention resulting in the need for intensive care unit admission.

Documentation and Recognition of Patient Deterioration. The Process construct of the Nursing Role Effectiveness Model includes independent, dependent and interdependent nursing interventions. This includes the monitoring and documentation of vital signs which is often a task that is typically associated with nursing care. Vital signs provide essential information about how the body is functioning and coping with illness. Alterations in vital signs can be indicative of the body's inability to cope with changes brought on by acute or chronic illnesses. Changes in vital signs may be present well before a patient acutely deteriorates (Mapp, 2013; Ludikhuizen et al., 2012). Clues to patient deterioration may be subtle early on but the respiratory rate is one that tends to increase prior to other vital signs (Curry & Jungquist, 2014).

This study demonstrated that issues of the respiratory system were the most likely cause for urgent unplanned intensive care unit admission. In fact, respiratory distress accounted for

53% of all unplanned intensive care unit admissions. Respiratory distress or symptoms of respiratory failure have also been the leading cause of unplanned intensive care unit admissions in other research studies (Jonsson et al., 2011; Mohr, Lourenco, Cooke, & Aitken, 2013).

The respiratory rate can be highly sensitive to changes in a patient's condition. Many studies have found that changes in vital signs, particularly respiratory rate, are present 8 hours prior to either cardiac arrest or unplanned intensive care unit admission (Mapp et al., 2013; Cuthbertson et al., 2007). Despite the importance of monitoring changes in respiratory rates, in this study it was the least documented vital sign. Patients in this study had on average just over 3 sets of vital signs taken within the 12 hours prior to intensive care unit admission. When grouped together as sets of vital signs, the respiratory rate documentation was missing in at least one set of vital signs almost 74% of the time. Regardless, there was no significant correlation between documentation of a respiratory rate and unplanned intensive care unit admission in this study.

There are a number of possible reasons that respiratory rate documentation was not associated with unplanned intensive care unit admission. The importance of the respiratory rate is often under recognized and receives a much lower priority than other vital signs (Cooper, Cant & Sparkes, 2012). Nurses on the general ward may have failed to recognize the importance of the respiratory rate as a sign of clinical deterioration in the patient (Cuthbertson et al., 2007).

In the research site, vital signs are often taken by automated machines rather than by traditional observation and palpation. Automated machines typically do not count respiratory rates. Nurses may then quickly estimate respiratory rates based on previous documentation or expected norms (Cooper et al., 2012). It is quite possible that nurses inaccurately assess the respiratory rate by not actually counting the breaths per minute (Yuan, Drost & McIvor, 2013). Estimation rather than actually counting the respiratory rate is also prevalent in the medical

profession. It has been found that when health care personnel have estimated the respiratory rate it is often much higher than documented on reassessment (Philip et al., 2015).

Accurate assessment of all vital signs, particularly respiratory rate, and correct interpretation of changes in vital signs, is essential in the early identification of patients who are at risk of an unplanned intensive care unit admission. This, along with the understanding of the importance of vital sign measurement is likely to improve the documentation, communication and intervention on behalf of patients to improve outcomes (Mitchell et al., 2010). The identification of patients who are deteriorating is not captured adequately if vital sign assessment is incomplete or missing. It has been suggested that the prompt identification of changes in vital signs would allow for earlier treatment and therefore the need for unplanned intensive care unit admissions (De Meester et al., 2013; Jonsson et al., 2011).

It has been suggested that nurses also tend to use information other than vital signs to determine patient deterioration. The observance of a patient that is “just not right” also has value. This can include collateral data collected by talking with family members or significant others, observation of small changes in mental status such as a patient becoming anxious or withdrawn. By incorporating these visual cues along with vital sign assessment patient deterioration could potentially be identified much earlier than with vital sign data alone (Brier et al., 2015).

Communication. According to the Nursing Role Effectiveness Model communication is an interdependent component of nursing practice. The lack of adequate communication has been associated with many adverse events within the hospital setting (Manojlovich et al., 2015). This study assessed only whether the most responsible physician or the critical care response team was notified, it did not look at the response provided or the complex interplay of communication.

Communication amongst health care professionals is essential for patient care. Effective communication skills and strategies allow for timely intervention when a patient is beginning to deteriorate (Classen, 2010). This study showed a medium negative correlation between the number of times vital signs were taken and communication with the most responsible physician. This means that as communication with the most responsible physician increased, the number of times vital signs were taken decreased. Nurses contact physicians for direction when something changes in the patient's condition to obtain advice, or treatment orders. Thus, one interpretation of this finding is that nurses contacted the most responsible physician for consultation when they were concerned about the patient's condition. Once the physician was involved, the need for further evidence of vital sign deterioration may not have been necessary. It should be noted, however, that this study did not evaluate the nature of the communication between the nurse and most responsible physician. It also did not evaluate if there was any follow up from either the nurse or the physician and whether any medical intervention was prescribed.

The critical care response team (CCRT) is a resource available to all health care professionals within the study site. A critical care response team is a team of critical care practitioners that work with all hospital staff to identify patients who may deteriorate to the point of requiring the intensive care unit (Critical Care Services Ontario). In the study site the critical care response team includes a critical care registered nurse, a critical care staff physician and a respiratory therapist. It is available without a physicians order as it is a nurse to nurse consult. The communication rate for this study showed a significant medium negative correlation between the number of vital signs taken and communication with the rapid response team in the 12 hours prior to admission. This means that the number of vital signs taken decreased as communication with the rapid response team increased. This finding is similar to the

communication with physicians and may suggest that nurses were concerned about their patient's clinical condition and were acting to improve outcomes. This study does not reflect however when the nurse became concerned about their patient or what prompted them to communicate with the rapid response team.

Having a strong communication strategy in place such as early warning scoring systems or SBAR (Situation, Background, Assessment and Recommendation) tools could improve the awareness and empower nurses to communicate with physicians earlier rather than later in regards to a patient's changing condition (Albert & Huesman, 2011). SBAR can help to improve the communication between nurses and physicians by providing a common way of organizing thinking in urgent situations. It can make the message that the nurse is attempting to convey more readily understood due to the preciseness of the information that is being delivered (Cornell, Gervis, Yates & Vardaman, 2014).

Directions for Future Research

Nurses' awareness of patient deterioration was not measured in this study. Future research could further focus on understanding why the respiratory rates are not recognized as giving extremely valuable information to the overall condition of the patient. The use of an automatic track and trigger system could be beneficial in that it would alert the nurse to the potential for patient deterioration and it could also alert the critical care response team earlier.

The experience level of nurses can play a direct role in the ability to communicate with physicians or other health care team member effectively. Nurses who have a greater amount of experience may be more comfortable in speaking with physicians and in using medical terminology. Those with less experience may not have this comfort level (Mok et al., 2015). Further understanding of the differences in communication patterns between physicians and

nurses would increase the awareness of what information is sought and how to present it in order to convey messages of urgency in regards to patient deterioration. The impact of skill mix though not analyzed in this study has been identified as an issue in regards to patient deterioration. Skill mix includes not only the level of experience of nurses but also that of physicians (Endacott, Kidd, Chaboyer, & Edington, 2007).

Nurses may often recognize subtle signs of patient deterioration that may not be reflected in vital signs (Mok et al., 2015). Future studies that looked at these early warning signs would be beneficial to improving patient outcomes. There are many different types of track and trigger systems that could potentially aid ward nurses in determining when a patient is deteriorating. These systems require more in-depth and rigorous approaches to determine their effectiveness but are worth exploring (McGaughey, Alderice, Fowler, Kapilia, Mayhew, & Moutray, 2007). As well, research could focus on the combination of early signs of deterioration, what triggers nurses to obtain a higher frequency of vital signs and how they communicate that information with physicians could lead to improved patient outcomes.

Prior to an unplanned intensive care unit admission the code status of patients is often reviewed with either the patient themselves or the next of kin (Chu & Hynes-Gay, 2002). Even if a do not resuscitate (DNR) order is in place patients who are deteriorating may still be admitted to the unit. This study did not look at DNR rates and admissions but it would be of interest to know how many patients remain on the ward because of their code status and if it made any difference in overall mortality.

Recommendations for Clinical Practice. In looking at nursing knowledge of subtle or early and late signs of deterioration especially in regards to respiratory rates, quality improvement initiatives could be focused on these aspects.

As well, truly understanding the communication between nurses, nurses and physicians or other members of the health care team could help to provide insight into this complex mechanism. Quality improvement could consist of building stronger communication networks and therefore improve patient care.

In order to strengthen communication between physicians and nurses especially in regards to patient deterioration a communication tool such as SBAR (Situation, Background, Assessment, and Recommendation) could be implemented (Cornell, Gervis, Yates, & Vardaman, 2014). This would improve the ability of the nurse to effectively and concisely provide information and receive the response that they are looking for in order to best assist the patient. It would also allow the physician to adequately prioritize what patients are requiring interventions first.

In order to raise awareness of the value of an accurate respiratory rate, a campaign could be implemented with the use of nursing champions. This campaign would encourage health care providers to actually count the respiratory rate for 1 minute and compare it to what has been recorded previously. This could help to show the discrepancies present in counting and estimating respiratory rates which will help to improve the understanding of early signs of patient deterioration. The accuracy of respiratory rates being documented could also lead to earlier identification of patients at risk of unplanned intensive care unit admission.

Strengths and Limitation of this Study. The strength of this study is that it focuses in on the process component of the Nursing Role Effectiveness Model. The issues of communication, documentation and the ability to recognize patient deterioration are ones that front line nurses can independently continue to improve upon. In turn these processes will assist in creating best possible outcomes for patients and prevent the need for unplanned intensive care unit

admissions. The limitation of this study is that within the process of communication it was limited to whether nurses contacted the most responsible physician or the critical care response team. It did not consider whether the contact time was appropriate or the style of communication utilized. As well, it is difficult to determine whether there was recognition of patient deterioration or lack thereof with this style of study.

Conclusion

Nurses need to understand and critically appreciate the vast amount of information that can be obtained from the collection of vital signs such as the respiratory rate. In understanding the value of abnormalities in vital signs more patients could be identified earlier which could lead to earlier intervention and therefore prevent the need for an intensive care unit admission. Communication, documentation and recognition of patient deterioration play a key role in preventing patient deterioration. These skills need to be strengthened by front line nurses in order to help prevent unplanned intensive care unit admissions.

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Appendix A

Ethical Approval from the Research Ethics Board of Laurentian



APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS

Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / New / Modifications to project / Time extension	
new	
Name of Principal Investigator and school/department	Jennifer Martin - Nursing
Title of Project	Nursing Processes Related to Unplanned Intensive Care Unit Admissions
REB file number	2014-07-04
Date of original approval of project	21 Aug, 2014
Date of approval of project modifications or extension (if applicable)	
Final/Interim report due on: (You may request an extension)	21 Aug, 2015
Conditions placed on project	--

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate REB form.

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate LU REB form. In all cases, please ensure that your research complies with Tri-Council Policy Statement (TCPS). Also please quote your REB file number on all future correspondence with the REB office.

Congratulations and best wishes in conducting your research.

A handwritten signature in blue ink that reads "Rosanna Langer". The signature is written in a cursive, flowing style.

Rosanna Langer, PHD, Chair, *Laurentian University Research Ethics Board*

Appendix B

Ethical Approval from the Research Ethics Board of St. Michael's Hospital

REB 14-351 Nursing Processes Related to Unplanned Intensive Care Unit Admissions

Dear Ms. Martin,

I hope this finds you well. Your application submitted on October 16, 2014 for the above named study has been accepted for delegated review. The delegated review letter is available in the main Research Ethics Office. An electronic version of the delegated review letter is attached for your convenience.

Do not hesitate to contact me should you wish to discuss. I look forward to your response.

Best regards,
Chantal

Chantal Diniz, Research Projects Assistant

Research Ethics Office

St. Michael's Hospital - 30 Bond Street Toronto, Ontario M5B 1W8

Office Location: 250 Yonge St 6th Floor

Phone: 416-864-6060 ext. 76206

Email: dinizc@smh.ca

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Research Ethics Office
Telephone: (416) 864-6060 Ext. 2557
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E-mail: pateld@smh.toronto.on.ca

St. Michael's

Inspired Care.
Inspiring Science.

December 5, 2014

Ms. Jennifer Martin,
Department of Nursing,
St Michael's Hospital

Dear Ms. Martin,

Re: REB# 14-351^C - Nursing Processes Related to Unplanned Intensive Care Unit Admissions

REB APPROVAL:	Original Approval Date	December 05, 2014
	Annual/Interval Review Date	December 05, 2015

Thank you for your application submitted on **October 16, 2014**. The above noted study has been reviewed through a delegated process (not by Full Board review). The views of the St. Michael's Hospital (SMH) Research Ethics Board (REB) have been documented and resolved. Please note that no member of the St. Michael's Hospital Research Ethics Board associated with this study was involved in its review or approval.

The REB approves the study as it is found to comply with relevant research ethics guidelines, as well as the Ontario Personal Health Information Protection Act (PHIPA), 2004. The REB hereby issues approval for the above named study for a period of 12 months from the date of this letter. Continuation beyond that date will require further review of REB approval. In addition, the following documents have been reviewed and are hereby approved:

1. Protocol (ver: 02-Dec-2014)

Furthermore, the following documents have been received and are acknowledged:

1. Laurentian University REB Approval Letter
2. Master Linking Log (ver: 17-Nov-2014)

During the course of this investigation, any significant deviations from the approved protocol and/or unanticipated developments or significant adverse events should immediately be brought to the attention of the REB.

Please note that if a Clinical Trial Agreement is required, it must be submitted to the Office of Research Administration for review and approval. Any additional institutional approvals **must be** coordinated and approved through the Office of Research Administration prior to initiation of this research. All drug dispensing must be coordinated through the Research Pharmacy at 416-864-5413.

The St. Michael's Hospital (SMH) Research Ethics Board (REB) operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans, the Ontario Personal Health Information Protection Act, 2004, and ICH Good Clinical Practice Consolidated Guideline E6, Health Canada Part C Division 5 of the Food and Drug Regulations, Part 4 of the Natural Health Product Regulations, and the Medical Devices regulations. Furthermore, all investigational drug trials at SMH are conducted by Qualified Investigators (as defined in the latter document).

With best wishes

☐ Dr. David Mazer
Chair, Research Ethics Board

☐ Dr. Philip Berger
Vice Chair, Research Ethics Board

☒ Dr. Brenda McDowell
Vice Chair, Research Ethics Board

DM/PB/BJM/cd

Ms. Jennifer Martin (REB# 14-351)

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Appendix C

Chart Audit Tool - Nursing Processes Related to Unplanned Intensive Care Unit Admissions

Demographics	
Coded Identifier Number	
Time Admitted (24 hour time)	
Day of Week Admitted	
Reason for admission	
Co morbidities	
Service admitted to	

Demographics	Scores
Age	
Gender Male = 1 Female = 2	
Previous Admission to ICU Yes = 1 No = 2	

Communication and Documentation Questions	Scores
Was there documentation of communication with MRP Yes = 1 No = 2	
Was there documentation of communication with RRT Yes = 1 No = 2	
If there was communication with the MRP or RRT is there documentation of intervention in nursing notes Yes = 1 No = 2	
Was there documentation of LOC (either GCS or narrative words alert, confused, unresponsive or similarities) Yes = 1 No = 2	
Was there documentation of urine output Yes = 1 No = 2	
Was any information other than alert and oriented documented Yes = 1 No = 2	

Data to be collected	
Is there data missing from vital signs Yes = 1 No=2	
If any data is missing from vital sign collection what is it Temp = 1 Pulse = 2 Respiratory Rate = 3 Blood pressure = 4 Oxygen saturation = 5	